

(12) UK Patent Application (19) GB (11) 2 250 783⁽¹³⁾A
(43) Date of A publication 17.06.1992

(21) Application No 9123318.9

(22) Date of filing 04.11.1991

(30) Priority data

(31) 4035013

(32) 03.11.1990

(33) DE

(71) Applicant
Papst-Motoren GmbH & Co KG

(Incorporated in the Federal Republic of Germany)

Postfach 1435, D-7742 St Georgen 1,
Federal Republic of Germany

(72) Inventors
Günter Wrobel
Wolfgang Engel
Raimund Engelberger

(74) Agent and/or Address for Service
W H Beck, Greener & Co
7 Stone Buildings, Lincoln's Inn, London, WC2A 3SZ,
United Kingdom

(51) INT CL⁶
F04D 29/66 29/26

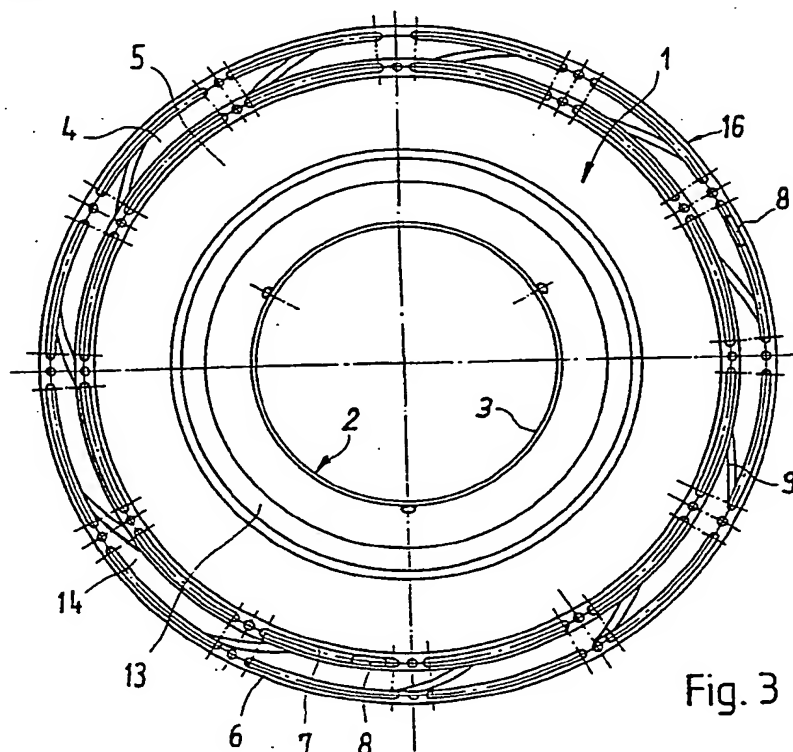
(52) UK CL (Edition K)
F1V VCE VCF V102 V104 V200 V202 V214
U1S S2006

(56) Documents cited
GB 2139709 A GB 1500575 A GB 1107315 A
GB 1081605 A GB 0805371 A GB 0588385 A

(58) Field of search
UK CL (Edition K) F1V VCE VCF
INT CL⁶ F04D

(54) Balancing fan impellers

(57) An impeller 16 for a radial fan has two coaxial, axially spaced guide rings 4, 5 between which a plurality of fan blades (11 figure 4) are supported for rotation by a hub (3). A plurality of pockets 6, 7 which open axially are provided in each guide ring 4, 5 for the insertion of balancing weights 8. This arrangement reduces the manufacturing costs of the impellers and provides a simplified balancing process. The balance weights and pockets may be applied to other types of fan eg axial blowers.



At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

GB 2 250 783 A

Fig. 1

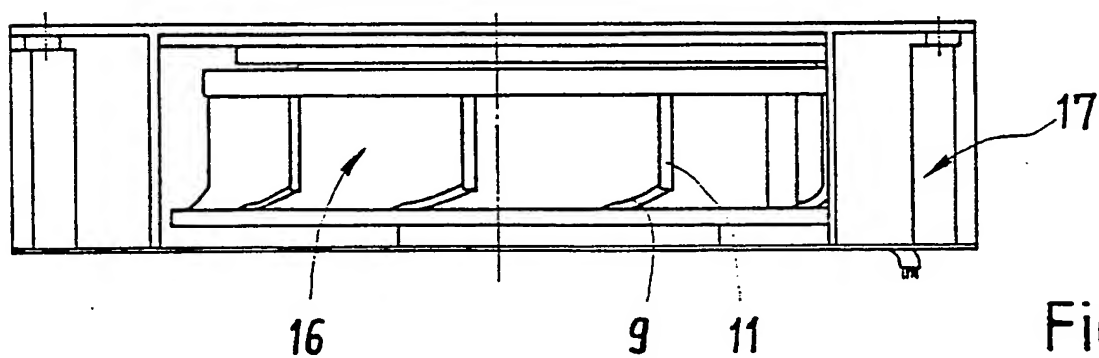
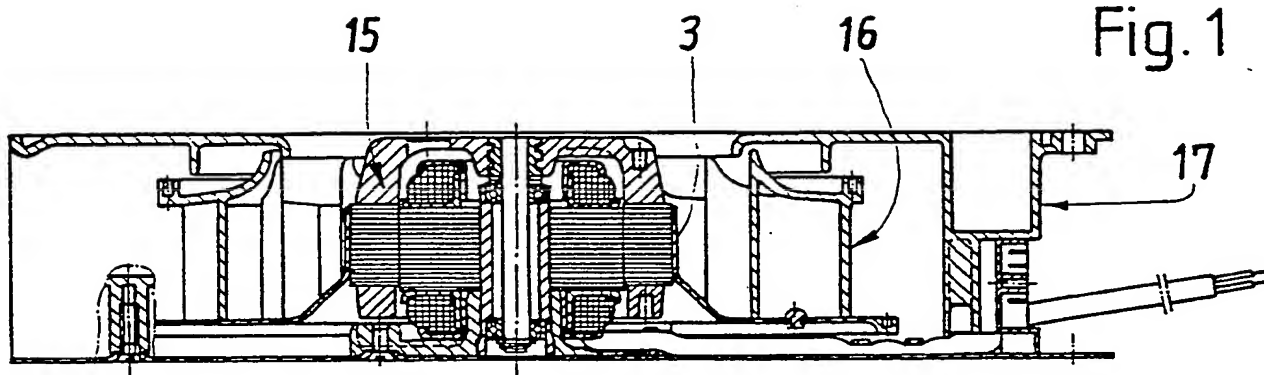


Fig. 2

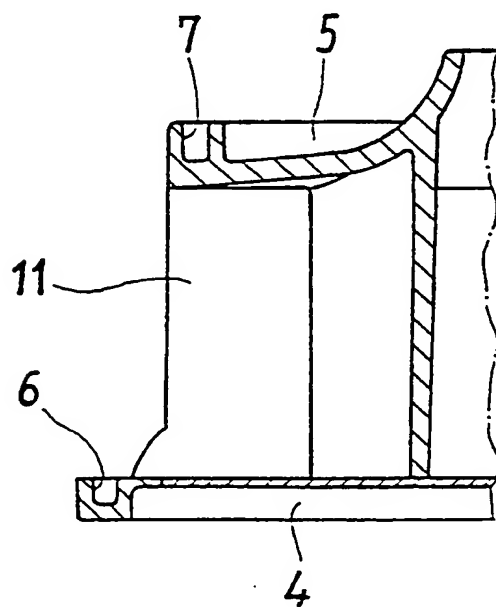
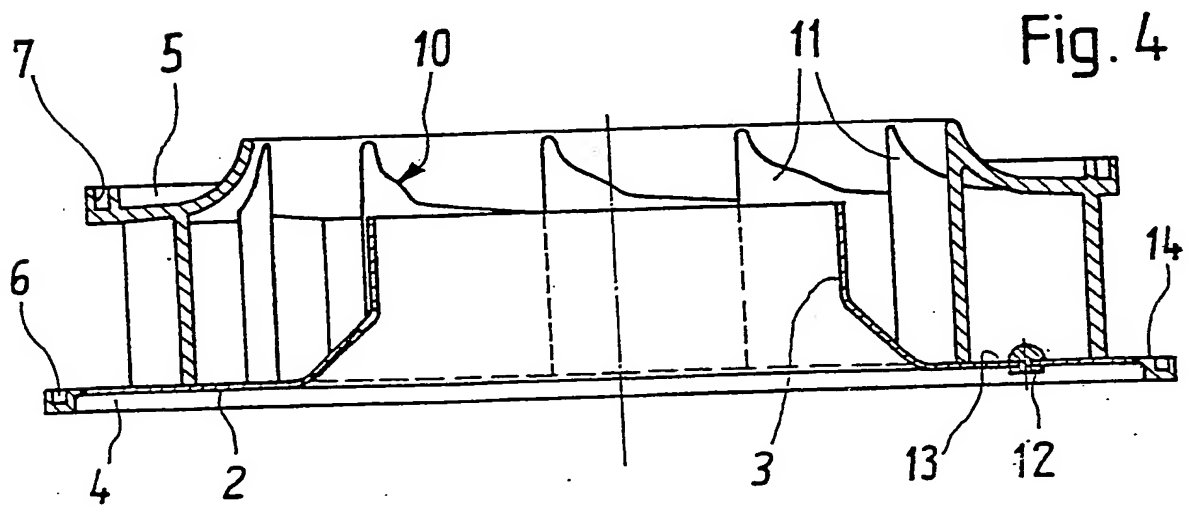
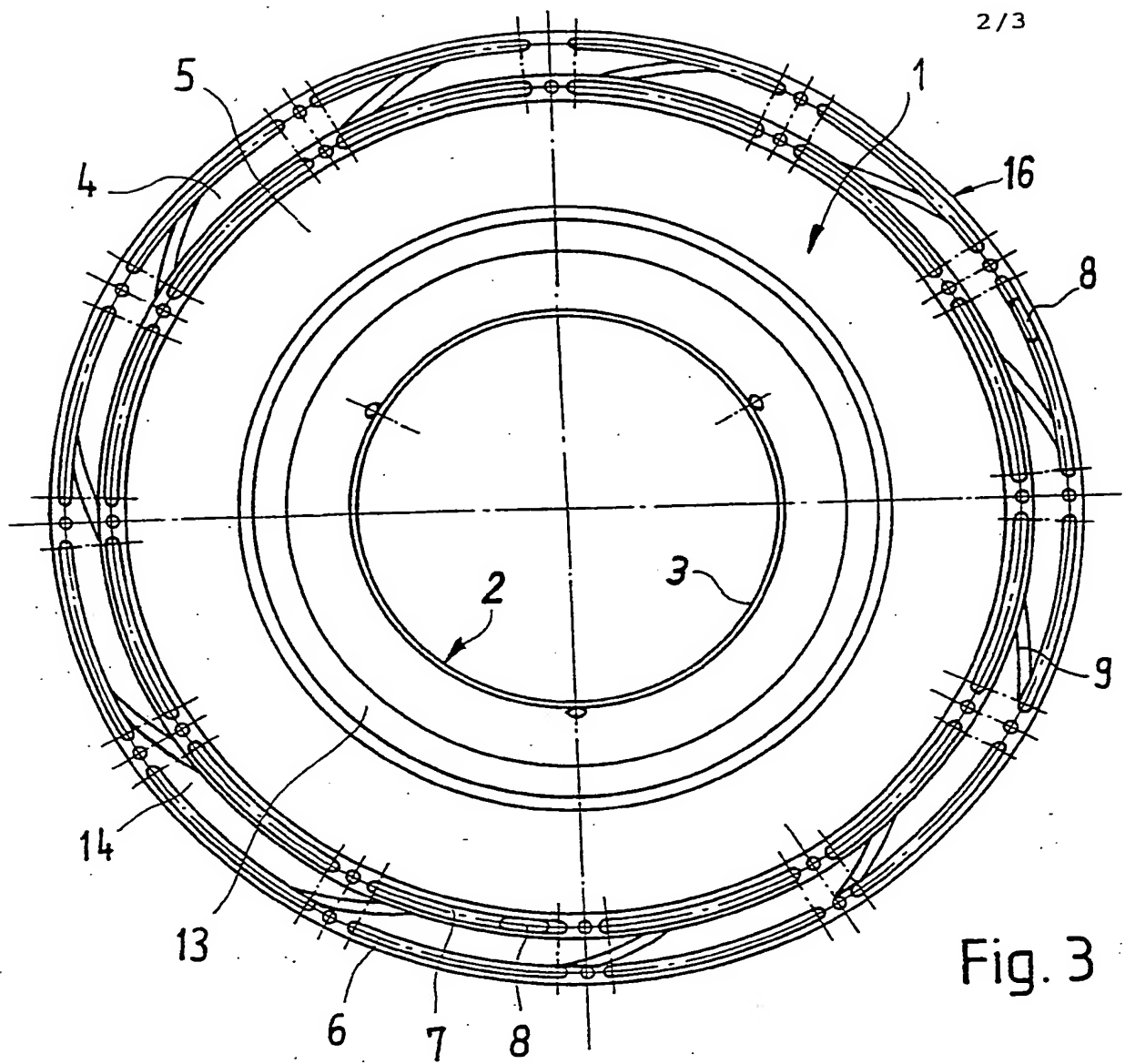


Fig. 5



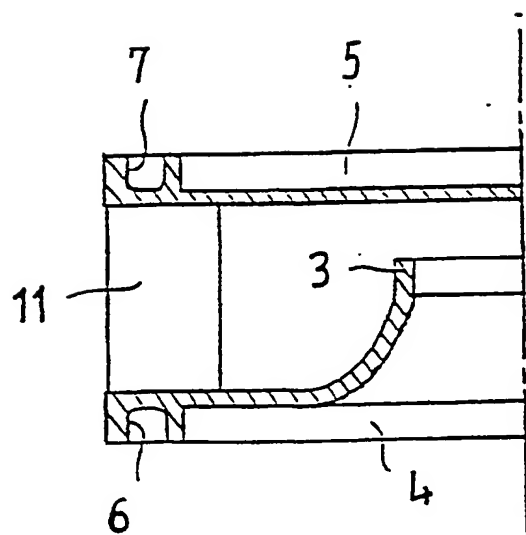


Fig. 6

-1-

IMPROVEMENTS IN OR RELATING TO FAN IMPELLERS

The present invention relates to an impeller for a blower, for example for a radial fan.

5

In radial fans, the air or the like is sucked in axially and blown out radially. Generally, the impellers of such fans are made from sheet metal. For example, a blade ring or rim is positioned between two guide rings and is connected thereto, for example, by bending over sheet metal tabs or by pinned fitting. If in the case of larger impeller diameters balancing of the impeller is necessary, then balancing weights are fixed by clips to appropriate points of the impeller. It is also possible to balance the impeller by a planned milling away of parts of the impeller. Such techniques are also used with other types of blowers, for example, with axial-flow fans.

It is an object of the present invention to simplify the manufacture and balancing of impellers for fans, particularly for radial fans, and to cut down production costs.

According to the present invention there is provided an impeller for a fan comprising a hub for rotation by a drive rotor and a plurality of fan blades for rotation with the hub, the impeller further comprising a support or guide member supporting or connecting fan blades of said plurality, and wherein one or more pockets are provided in said support or guide member and open axially of the fan for receiving balance weights.

In an embodiment, for a radial fan, said support or guide member is a guide ring arranged coaxially of said hub and supporting said plurality of fan blades.

For example, an impeller for a radial fan may have at least one of the guide rings provided with pockets. Preferably, said guide rings are arranged coaxially, and each is equipped with pockets, so as to permit complete
5 dynamic balancing. The pockets may be in the form of axially open grooves, grooved sectors or bores.

In order to permit the insertion of balancing weights in simple manner on both guide or support rings without
10 impediment by the other guide ring, both guide rings preferably have different diameters, the diameter steps being towards the open side of the pockets and the pockets of both guide rings being open to the same side. This makes it possible for the insertion of balancing weights
15 from one side to not only take place without impediment on the front guide ring, but also on the larger diameter guide ring positioned behind it. However, it is also possible to construct the pockets so as to be open to both sides.

20 The impeller can be manufactured particularly inexpensively, if it comprises a plastics injection moulding, which encloses in one-piece manner the two guide rings and the interposed blade ring, as well as a sheet metal disk forming the hub and fixed to the plastics
25 injection moulding by hot crimping of pins of the plastics part inserted in holes in the sheet metal disk. The one-piece injection moulding of this part is made particularly easy in that both guide rings have different diameters, which facilitates the design of the mould.

30 In a particularly advantageous development of the invention the pins for fixing to the sheet metal disk are located on lateral faces of the blades of the blade ring and the larger diameter guide ring is connected by
35 connecting webs injection moulded onto the blades to the ends of the latter. This makes it possible to produce the

plastics injection moulding with only two mould halves and without requiring slides. The sheet metal disk is preferably located within the associated guide ring and its inner face is aligned with the inner face of the guide ring.

Embodiments of the present invention will hereinafter be described, by way of example, with reference to the accompanying drawings, in which:-

Figure 1 shows a longitudinal section through a radial fan having an impeller of the invention,

Figure 2 shows a side view of the radial fan of Figure 1,

Figure 3 is an end view of the impeller of the radial fan shown in Figures 1 and 2,

Figure 4 shows an axial section through the impeller of the fan of Figure 3,

Figure 5 shows a detail of the impeller of Figure 4 showing on a larger scale pockets for the insertion of balancing weights, and

Figure 6 is a view similar to that of Figure 5 showing a detail of another embodiment of an impeller.

The radial fan shown in Figures 1 and 2 has a fan casing 17, an impeller 16 and a drive motor 15. In the illustrated embodiment, the drive motor 15 is constructed as an external rotor-type motor having a centrally arranged stator surrounded by an external rotor. A hub portion 3 of the impeller 16 is pressed onto the rotor or a rotor hub such that the impeller 16 rotates with the rotor. Upon rotation of the impeller 16, the radial fan is arranged to suck in air from above, as illustrated in Figures 1 and 2, and blow it out radially.

The impeller 16 of the radial fan is illustrated in Figures 3 and 4 and is made of two parts, namely a plastics

injection moulding 1 and a sheet metal disk 2. The injection moulding 1 defines two axially spaced guide rings 4 and 5 and a blade ring 10 with blades 11 disposed between said guide rings 4 and 5. On radially extending, axial ends of the blades 11, the plastics injection moulding 1 is provided with pins 12, which each extend through a corresponding bore in the sheet metal disk 2 and which are interconnected by hot crimping the two parts. Preferably, each blade 11 carries several radially spaced pins 12, which are fixed by hot crimping in corresponding bores of the sheet metal disk 2, so as to create a stable impeller and also avoid resonances and vibrations.

The plastics injection moulding 1 is constructed in such a way that the two guide rings 4, 5 have different diameters and are arranged in stepped succession. This enables the moulding 1 to be formed in a two-part injection mould without the use of slides and the like. The sheet metal disk 2 is placed within the guide ring 4 and shaped by means of connecting webs 9 onto the outer ends of the blades 11. The inner faces 13 or 14 of the sheet metal disk 2 or the guide ring 4 are aligned with one another, so as not to disturb flow conditions on the impeller 16. Figure 4 also shows that the sheet metal disk 2 has an inwardly drawn over hub portion 3, which is pressed onto the external rotor of the drive motor 15.

It can be seen in Figures 3 to 5 that both the guide rings 4 and 5 have pockets 6 or 7 formed therein. These pockets 6, 7 open axially. For balancing purposes it is possible to press into these pockets 6, 7 balancing weights, as 8, which weights, for example, may be of lead, and as a result of the configuration of these pockets adequate fixing against centrifugal forces is obtained.

The pockets 6, 7 for receiving the balancing weights 8

are, in the illustrated embodiment, grooved sectors provided on the radially extending, external surfaces of the guide rings 4, 5 and are open axially. The subdivision into grooved sectors increases the stability of the guide rings 4, 5 due to the interposed webs. However, it is also possible to replace the grooved sectors by through grooves or individual bores arranged around the circumference and which are axially open to one side. Figures 3 to 5 show that the guide rings 4, 5 have staggered diameters, so that the balancing weights 8 can be inserted from one side without any impediment. This diameter staggering is also appropriate to permit the production of the plastics injection moulding 1 in one piece using a two-part mould.

It is also possible, in the case of the embodiment shown in Figures 1 to 5, for the pockets 6, 7 to open to both sides (in the axial direction), so that the balancing weights 8 can be inserted from a random side.

In a further embodiment of an impeller of the invention, which is illustrated in Figure 6, the two guide rings 4, 5 have the same diameter and the complete impeller 16 comprising the guide rings 4, 5, the fan blades 11 and the hub portion 8 is injection moulded in plastics material in one piece, for example, with the aid of a slide mould. This impeller has no need for a metal part, such as the sheet metal disk 2.

As shown in Figure 6, the pockets 6, 7 in the two guide rings 4, 5 open axially in two opposite directions, but the pockets 6, 7 for the insertion of the balancing weights 8 may be open to the same side (in the axial direction) if required. As previously, the pockets may be continuous grooves or bores or interrupted grooves or spaced recesses.

Although the invention has been described and illustrated with respect to a radial fan, it can be used with other fan types. If the fan is, eg an axial blower, then support rings will usually be provided. Such support
5 rings may either carry the fan blades, or, in the case of larger diameter impellers, may be located on the blade tips and interconnect the same. The said support rings may be provided with axially open pockets for the insertion of balancing weights.

10

It will be appreciated that modifications in or variations of the embodiments as described and illustrated may be made within the scope of the appended claims.

CLAIMS

1. An impeller for a fan comprising a hub for rotation by a drive rotor and a plurality of fan blades for rotation with the hub, the impeller further comprising a support or guide member supporting or connecting fan blades of said plurality, and wherein one or more pockets are provided in said support or guide member and open axially of the fan for receiving balance weights.
2. An impeller as claimed in Claim 1, for a radial fan, wherein said support or guide member is a guide ring arranged coaxially of said hub and supporting said plurality of fan blades.
3. An impeller as claimed in Claim 1 or 2, for a radial fan, and having two axially spaced guide rings and a blade ring interposed between said guide rings, wherein at least one of the guide rings is provided with pockets.
4. An impeller as claimed in Claim 3, wherein said guide rings are arranged coaxially and are provided with pockets.
5. An impeller as claimed in any of the preceding claims, wherein the pockets are continuous or interrupted grooves, which open axially or continuous or interrupted bores.
6. An impeller as claimed in any preceding claim, and having two axially spaced guide rings between which said plurality of fan blades are supported, wherein said two guide rings have different diameters, and the diameter staggering takes place towards the open side of the pockets, and the pockets of both guide rings are open axially to the same side or to both sides.
7. An impeller as claimed in any preceding claim, formed

as a plastics injection moulding, which surrounds two guide rings and an interposed blade ring, and a sheet metal disc, which forms the hub and is fixed to the plastic injection moulding by hot crimping of pins of the moulding inserted
5 in bores of the sheet metal disk.

8. An impeller as claimed in Claim 7, wherein the pins are located on lateral faces of the blades of the blade ring, and one of the guide rings is connected to the ends
10 of the blades by means of connecting webs injection moulded onto the blades.

9. An impeller as claimed in Claim 7 or 8, wherein the sheet metal disk is placed within the associated guide
15 ring, and the inner face of the metal disk is aligned with the inner face of said guide ring.

10. An impeller as claimed in any of Claims 1 to 5, and having two axially spaced guide rings between which said
20 plurality of fan blades are supported, wherein the two guides rings have substantially the same diameter, and the impeller comprising the guide rings, the fan blades and the hub is injection moulded from plastics material in one piece.

25
11. An impeller as claimed in Claim 10, wherein pockets are provided in both guide rings, these pockets being open to the same side, to opposite sides, and/or in a continuous manner.

30
12. A fan incorporating an impeller as claimed in any preceding claim.

13. An impeller for a fan substantially as hereinbefore
35 described with reference to the accompanying drawings.

- 9 -

Patents Act 1977
Examiner's report to the Comptroller under
Section 17 (The Search Report)

Application number

9123318.9

Relevant Technical fields

(i) UK CI (Edition K) F1V (VCE, VCF)

(ii) Int CI (Edition 5) F04D

Databases (see over)

(i) UK Patent Office

(ii)

Search Examiner

R D CAVILL

Date of Search

5 FEBRUARY 1992

Documents considered relevant following a search in respect of claims

1-13

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
X	GB A 2139709 (GEC) SEE FIGURE 1 AND PAGE 2 LINES 37 ET SEQ	1, 5
X	GB 1500575 (GEC) SEE FIGURES 1, 2 AND 5 PARTICULARLY, NOTE BALANCE WEIGHTS 56	1, 5
X	GB 1081605 (MAN) SEE PAGE 2 LINES 27-32	1
X	GB 1107315 (TORRINGTON) SEE FIGURES 1 AND 3 AND NOTE BALANCE WEIGHTS 20	1, 5, 12
X	GB 805371 (ROLLS ROYCE) SEE FIGURES 1 AND 2 AND NOTE BALANCE WEIGHTS 18	1, 5
X	GB 588385 (AIRSCREW) SEE FIGURES, PARTICULARLY THE BALANCE PIECES 17 SHOWN IN FIGURE 1	1, 5, 12

Category	Identity of document and relevant passages	Relevant to claim(s)

Categories of documents

X: Document indicating lack of novelty or of inventive step.

Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.

A: Document indicating technological background and/or state of the art.

P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

&: Member of the same patent family, corresponding document.

Databases: The UK Patent Office database comprises classified collections of GB, EP, WO and US patent specifications as outlined periodically in the Official Journal (Patents). The on-line databases considered for search are also listed periodically in the Official Journal (Patents).